CLAIMS

1. A method of producing a thick nonlinear optical grating (2) from an initial thick nonlinear optical grating (1), the thickness (E_2) of the nonlinear optical grating (2) being greater than the thickness (E_0) of the initial nonlinear optical grating (1), said initial grating comprising at least one plurality of mutually parallel plane layers (20), said layers having at least two nonlinear coefficients having algebraically different values, said initial grating having a first face (11) and a second face (12) that are approximately parallel to each other and approximately perpendicular to the mean plane of the layers, and said second face (12) being free, characterized in that it comprises the following production steps:

- a first step of determining the thickness (E_{01}, E_{02}) of that upper part of the initial grating (1) which lies beneath the second face (12), which upper part has structural imperfections;
- a second step of polishing the second face (12) of said initial grating (1), making it possible to remove the upper part having said imperfections and to obtain a polished and plane third face (13), said face approximately perpendicular to the mean plane of the layers (20);
- a third step of cleaning and checking said third face (13); and
- at least a fourth step of epitaxially depositing at least one layer (1a, 1b) of material deposited on said third face (13), the epitaxial growth reproducing, in said deposited layer, a structure similar to that of the initial grating, the combination of the initial grating (1) and said deposited layer (1a, 1b) constituting the nonlinear optical grating (2).

2. The method of producing an optical grating (2) as

claimed in claim 1, characterized in that the means of determining the thickness having imperfections are optical display devices.

3. The method of producing a nonlinear optical grating (2) as claimed in either of the preceding claims, characterized in that, after the second production step, the thickness (E_1) of the initial optical grating is at least 50 microns.

4. The method of producing a nonlinear optical grating (2) as claimed in claim 1, characterized in that the initial nonlinear optical grating (1) is supported by a seed substrate (3) having a lower face (14) and a plane upper face (11), the upper face (11) of the seed substrate coinciding with the first face (11) of said initial nonlinear optical grating (1).

5. The method of producing a nonlinear optical grating (2) as claimed in claim 4, characterized in that the seed substrate (3) comprises a crystalline material having a first crystal orientation, the upper face (11) of the seed substrate having a thin structure, said structure being formed from a precursor grating of parallel bands of the same crystalline material but of the opposite orientation to that of the seed substrate (3).

6. The method of producing a nonlinear optical grating (2) as claimed in claim 5, characterized in that the thickness of the seed substrate (3) is at least 300 microns.

7. The method of producing an optical grating (2) as claimed in claim 4, characterized in that the second production step includes the following preliminary steps:

- a first preliminary step of polishing the lower face (14) of the substrate; and

• a second preliminary step of bonding at least said lower face (14) to at least one plane support (32), the fitting of the support making it easier to handle the initial optical grating (1) for the subsequent polishing operations.

8. The method of producing a nonlinear optical grating (2) as claimed in claim 4, characterized in that the initial nonlinear optical grating (1) is obtained by the epitaxial growth method called HVPE (hydride vapor phase epitaxy) on the upper face of the seed substrate (3).

9. The method of producing an optical grating (2) as claimed in claim 1, characterized in that the method of producing the initial nonlinear optical grating (1) includes the following substeps:

• a first substep of producing a stack of crystalline plates (21) having plane parallel faces, of the same material, of small thickness and of periodically alternating crystal orientation; and

• a second substep of assembling said crystalline plates so as to obtain a single monolithic assembly (1) constituting the initial optical grating, said initial grating having a first face (11) and a second face (12) that are approximately perpendicular to the mean plane of the crystalline plates.

10. The method of producing an optical grating as claimed in claim 9, characterized in that the second step in the production of the initial grating (2) is preceded by the following preliminary steps:

• a first preliminary step of polishing the first face (11) of the monolithic stack; and

• a second preliminary step of bonding at least said first face (11) to at least one plane support (32), the fitting of the support making it easier to handle the monolithic assembly for the subsequent operations of polishing the second face (12).

11. The method of producing an optical grating (2) as claimed in one of the preceding claims, characterized in that, during the fourth production step, at least two layers (1a, 1b) of materials of different optical index are deposited so as to form an optical waveguide.

12. The method of producing a nonlinear optical grating (2) as claimed in one of the preceding claims, characterized in that, during the fourth production step, at least one of the layers (1a, 1b) is obtained by the epitaxial growth method called OMCVD (organometallic chemical vapor deposition) or by MBE (molecular beam epitaxy).

13. An optical component comprising at least one nonlinear optical grating (2) obtained by a method as claimed in one of the preceding claims, characterized in that at least one of the materials of one of the nonlinear gratings (1, 2) is indium phosphide (InP) or gallium phosphide (GaP) or indium arsenide (InAs) or indium antimonide (InSb).